DEPARTMENT OF ENVIRONMENTAL QUALITY
PERMITTING and COMPLIANCE DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

Fact Sheet

Permittee:	Town of Philipsburg
Permit No.:	MT0031500
Receiving Water:	Flint Creek
Facility Information:	
Name:	Town of Philipsburg domestic wastewater treatment facility
Location:	46°20'52"N latitude, 113° 19'10"W longitude Granite County
Facility Contact:	John Vukonich Director of Public Works P.O. Box 339 Philipsburg, MT 59858
Fee Information:	
Type:	Minor Publicly Owned Treatment Works (POTW)
Number of Outfalls:	1 (for fee purposes)
Outfall:	001- treated domestic wastewater

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I. Permit Status

This is a renewal of the existing MPDES permit MT0031500 for the Town of Philipsburg (Philipsburg) domestic wastewater treatment facility (WWTF). The previous permit was effective August 1, 2007, modified December 3, 2008 for monitoring clarifications, and expired July 31, 2012. The Montana Department of Environmental Quality (DEQ) received a complete renewal application on January 13, 2012. Under the Administrative Rules of Montana (ARM) 17.30.1313, permit MT0031500 was administratively extended and remains in effect until such time as DEQ issues a renewed permit.

Summary of Proposed Changes

- Cadmium and antimony: Monitoring will be removed.
- Total Dissolved Solids: Monitoring will be removed.
- Mercury, copper, lead, arsenic, and iron: Monitoring will be included.
- Total Residual Chlorine: Conditional limits will be included.
- Nutrients: Limits will be modified.

II. Facility Information

A. Facility Description

Philipsburg WWTF was constructed in 1961 and consists of a two-cell facultative lagoon system incorporating primary separation followed by secondary treatment. Both cells are approximately 6-acres in size. The average design flow is 0.16 million gallons per day (mgd). Actual detention time varies based on influent/infiltration (I/I) issues with irrigation of an adjacent field. Influent flow is measured through a 6-inch Parshall flume with staff gauge and chart. Influent samples are taken at the influent manhole. A bypass of cell one can occur with manual manipulation of the influent pipe. The entire system cannot be bypassed. The facility received minor upgrades in 1994 and now the current operation design runs the cells in series. Effluent discharge is continuous without disinfection. Discharge occurs at the end of pipe from cell two to Flint Creek via a constructed ditch approximately 400 feet long (person. comm., John Vukonich, 6/19/15). Effluent flow is measured through a 9-inch Parshall flume with staff gauge and chart. Effluent samples are collected at the discharge pipe from cell two. The current design criteria summary is located in **Appendix A**, and **Appendix B** includes a flow diagram for Philipsburg WWTF.

The Philipsburg wastewater collection system has been replaced in sections. The wastewater sources are sanitary only. There are no industrial users on the system. Philipsburg WWTF has experienced issues with I/I and sludge which have negatively affected the quantity and quality of their discharge. Sludge removal is necessary in cell one because sludge depth ranges from 22 to 30 inches (person. comm., John Vukonich, 6/19/15). Philipsburg is addressing both I/I and sludge issues through upgrades required under an Administrative Order of Consent (AOC) originally entered on January 8, 2010, and amended on the following dates: March 25, 2011, February 3, 2012, and May 21, 2014.

Philipsburg anticipates upgrading to an aerated lagoon system, but DEQ has not received a formal proposal for these upgrades. Per the May 21, 2014 AOC amendment, Philipsburg WWTF will submit plans and specifications for proposed upgrades by December 15, 2015, and upgrades are to be completed and the facility operational by October 28, 2016.

B. Effluent Characteristics

Table 1 summarizes monthly self-monitoring data submitted by the permittee for the Period of Record (POR) March 2010 through March 2015.

Table 1: Effluent Characteristics[1] for the Period March 2010 through March 2015.

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number of Samples
Flow, Daily Average	Effluent	mgd	[2]	0.03	1.8	0.1	61
5-Day Biochemical Oxygen Demand (BOD_5)	Influent[3]	mg/L	[2]	2.66	327.5	202.77	33
	Effluent	mg/L	30/45[4]	3.84	47.83	18.51	61
	NA	% removal	85	40.98	98.3	87.65	61
	Effluent	lbs/day	40/60[4]	1.2	79.69	15.42	61
Total Suspended Solids (TSS)	Influent[3]	mg/L	[2]	49.4	380	162	33
	Effluent	mg/L	45/65[4]	4	85	28.11	61
	NA	% removal	65	28.78	97.5	79.9	61
	Effluent	lbs/day	60/87[4]	2.58	333.18	26.59	61
Escherichia coli (*E. coli*) bacteria [5] [7]	Effluent	cfu[8]/100ml	126/252 [4]	ND	822	55.17	35
Escherichia coli (*E. coli*) bacteria [6] [7]	Effluent	cfu/100ml	630/1260[4]	4.1	16799.3	2325.03	26
pH	Effluent	s.u.	6.0-9.0	6.92	10.78	8.35	61
Temperature	Effluent	°C	[2]	1.2	26.4	10.06	61
Total Residual Chlorine (TRC)[9] [10]	Effluent	mg/L	0.011	--	--	--	--
Total Ammonia, as N	Effluent	mg/L	[2]	0.4	21	5.17	61
Kjeldahl Nitrogen, as N	Effluent	mg/L	[2]	1.73	26.3	8.62	61
Nitrate + Nitrite, as N	Effluent	mg/L	[2]	0	0.68	0.13	61
Total Nitrogen (TN)[11]	Effluent	mg/L	[2]	1.85	26.3	9.45	61
		lbs/day	[2]	0.22	31.5	7.31	61
Total Phosphorus (TP)[11]	Effluent	mg/L	[2]	0.58	5.83	2.47	60
		lbs/day	[2]	0.08	8.8	2.07	60
Dissolved Oxygen	Effluent	mg/L	[2]	3.35	17.28	8.38	31
Oil and Grease	Effluent	mg/L	[2]	ND	4.4	1.18	21
Total Dissolved Solids	Effluent	mg/L	[2]	ND	340	159.4	21
Hardness (as $CaCO_3$)	Effluent	mg/L	[2]	1.42	120	73.26	4
Antimony, Total Recoverable	Effluent	µg/L	[2]	1.06	2.02	1.37	4
Arsenic, Total Recoverable	Effluent	µg/L	[2]	7.21	14.6	9.25	4
Cadmium, Total Recoverable	Effluent	µg/L	[2]	ND	0.133	0.05	4
Copper, Total Recoverable	Effluent	µg/L	[2]	7.87	61.3	25.72	4
Lead, Total Recoverable	Effluent	µg/L	[2]	0.78	2.62	1.73	4
Mercury, Total Recoverable	Effluent	µg/L	[2]	ND	0.06	0.02	4

Footnotes:
(1) NA - Not applicable; ND - Non detect.
(2) No limit in previous permit; monitoring requirement only.
(3) DMRs updated July 2012 for influent BOD_5 and TSS.
(4) Monthly average /Weekly average.
(5) Limit applies from April 1 through October 31.
(6) Limit applies from November 1 through March 31.
(7) Geometric Mean if more than one sample is collected in the report period.
(8) Colony forming units.
(9) Maximum Daily.
(10) No disinfection during POR.
(11) Nondegradation loads were included in the Final Limits Table (TN: 40.8 lb/day and TP: 10.2 lb/day).

C. Compliance History

The Town of Philipsburg signed an Executed Administrative Order on Consent (AOC) (Docket No. WQ-09-10) with the DEQ Enforcement Division because of the facility's exceedances of BOD_5, TSS, and pH limits since May 2008. These limit exceedances are caused by the accumulation of excess sludge and the facility being antiquated. The AOC effective date is January 8, 2010.

Philipsburg WWTF reported the following exceedances of the interim enforcement limits during the POR: 21 total exceedances of BOD_5, 22 total exceedances of TSS, and seven exceedances of pH.

DEQ conducted a compliance evaluation inspection of Philipsburg WWTF on March 21, 2013. Seven conditions were found to be in violation with their permit. The conditions included:

- Failure to maintain records of sampling equipment calibration;
- Failure to calibrate equipment in accordance with 40 CFR, Part 136;
- Failure to correctly report monitoring results;
- Failure to properly collect composite samples;
- Failure to meet numeric effluent limits for BOD_5, TSS, and *E. coli* bacteria;
- Failure to properly operate and maintain all facilities and systems of treatment control; and
- Failure to submit complete Discharge Monitoring Reports within the required timeframe.

Philipsburg submitted explanation and corrective actions for the aforementioned violations to DEQ on June 17, 2013.

Philipsburg WWTF reported the following exceedances for the POR (in addition to exceedances of interim enforcement effluent limits):

- *E. coli* average monthly (April 1 through October 31) - 4;
- *E. coli* maximum daily (April 1 through October 31) - 4;
- *E. coli* average monthly (November 1 through March 31) - 8; and
- *E. coli* maximum daily (November 1 through March 31) - 8.

III. Receiving Water

A. Classification

Wastewater is discharged from the facility to Flint Creek. The receiving water is classified as B-1 according to Montana Water Use Classifications (ARM 17.30.607). Waters classified as B-1 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply [ARM 17.30.623(1)].

Flint Creek is located within the Columbia Basin and in the Flint-Rock United States Geological Survey (USGS) Hydrological Unit Code (HUC) 17010202. The Montana assessment unit for Flint Creek at the point of discharge is MT76E003_011, identified as the reach of the Flint Creek originating from Georgetown Lake to the confluence with Boulder Creek. This assessment unit is also identified as Upper Flint Creek. Philipsburg wastewater discharge is located approximately 13 miles downstream of Georgetown Lake.

The USGS has a gaging station (12329500) on Flint Creek near Maxville. The period of record for flow data collected at this gaging station is 1942-2009. According to this flow data, the 7-day, 10-year low flow (7Q10) is 24.9 cubic feet per second (cfs) or 16.1 million gallons per day (mgd). The seasonal (July-October)14-day, 5-year low flow (14Q5) is 51.9 cfs or 33.5 mgd. Reference **Appendix C** for explanation of the critical low flow revision for Flint Creek.

The receiving water in the vicinity of the discharge is listed on the 2014 303(d) List as a category 5 impaired stream. The impaired beneficial uses are aquatic life, drinking water, and primary contact recreation. Identified causes for impairments are alteration in stream-side or littoral vegetative covers, arsenic, copper, lead, low flow alterations, mercury, phosphorus (total), and sedimentation/siltation. Identified sources of impairment causes are agriculture, grazing in riparian or shoreline zones, and impacts from abandoned mine lands (inactive).

DEQ completed total maximum daily loads (TMDLs) for the assessment unit MT76E003_011 of Flint Creek which will be referred to as Upper Flint Creek for the remainder of the fact sheet. The Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan was approved in October 2012, and the Flint Nutrients TMDLs and Water Quality Improvement Plans was approved in December 2013. TMDLs are further discussed in **Section V. WQBELs** and reference **Appendix D** for TMDL development information.

B. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. DEQ has continued the previously granted standard mixing zone (100% of the 7Q10) to ammonia with the definable boundary of 280 feet downstream of the discharge in Flint Creek. A mixing zone study for ammonia will be required as a special condition of the permit renewal. Mixing zone rationale is located in **Appendix E**.

C. Applicable Water Quality Standards

Discharges to surface waters classified B-1 are subject to the specific water quality standards of ARM 17.30.623, Montana Department of Environmental Quality Circular DEQ-7 (DEQ-7), as well as the general provision of ARM 17.30.635 through 637. Dischargers are also subject to ARM 17.30 Subchapter 5 (Mixing Zones) and Subchapter 7 (Nondegradation of Water Quality).

IV. Proposed Technology-Based Effluent Limits (TBELs)

A. TBELs Standards and Limits

The proposed concentration-based TBELs satisfying the requirements of 40 Code of Federal Regulations (CFR) Part 133 [ARM 17.30.1203(14)(a)] are given in **Table 2**. The mass-based TBELs were developed using the average daily design flow (0.16 mgd). Additional rationale of Philipsburg WWTF's TBELs is located in **Appendix F**.

Table 2: TBELs based on Secondary Treatment Standards

Parameter	Units	Average Monthly Limit	Average Weekly Limit	Rationale
BOD_5	mg/L	30	45	40 CFR 133.102(a)
	lbs/day	40.0	60.0	
	% removal	85(1)	--	
TSS	mg/L	45	65	40 CFR 133.105(b)
	lbs/day	60.0	87.0	
	% removal	65(2)	--	
pH	s.u.	6.0-9.0 (instantaneous)		40 CFR 133.102(c)

Footnotes:
(1) The arithmetic mean of the values for BOD_5 for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (85% removal).
(2) The arithmetic mean of the values for TSS for effluent samples collected in a period of 30 consecutive days shall not exceed 35% of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (65% removal).

B. Nondegradation Load Allocations

The provisions of ARM 17.30.701 - 718 (Nondegradation of Water Quality) apply to

new or increased sources of pollution [ARM 17.30.702(17)]. Philipsburg WWTF has not increased flow or undergone any modifications that would be considered a "new or increased source" since the previous permit issuance in 2009, and a nonsignificance analysis is not required [ARM 17.30.705(1)].

BOD_5 and TSS load allocation will remain the same with permit renewal.

Baseline loads and the actual average loads discharged from the facility are presented in **Table 3.**

Table 3: Outfall 001 Nondegradation and Actual Loads for POR

Nondegradation Load Allocation Limits			Actual 30-day Average Loads				
Parameter	Units	Annual Average Load	2010	2011	2012	2013	2014
BOD_5	lbs/day	40	8	11	23	18	16
TSS	lbs/day	133	12	23	54	27	18

TN and TP nondegradation load allocations are removed per CFR§122.44(l) and CWA§402(o), and more stringent permit limits are included with the renewal. Additional rationale of Philipsburg WWTF's Nondegradation Load Allocations is located in **Appendix G**.

V. Proposed Water-Quality Based Effluent Limits (WQBELs)

Pollutants typically present in domestic lagoon effluent that may cause or contribute to a violation of numeric and/or narrative water quality standards include conventional pollutants such as biological material (measured by BOD_5), total suspended solids (TSS), oil & grease (O&G), pathogenic bacteria (*Escherichia coli*), pH; non-conventional pollutants such as dissolved oxygen (DO), total residual chlorine (TRC), total ammonia, and nutrients (total nitrogen and total phosphorus); and toxic pollutants such as metals. In accordance with 40 CFR 122.44, WQBELs are required to protect water quality standards when TBELs are not adequate. WQBELs requirements will be summarized in the following subsections. Reference **Appendix H** for additional WQBELs rationale and calculations for pollutants of concern.

A. Conventional Pollutants

BOD_5, TSS, and pH – The Philipsburg WWTF is required to provide significant reduction in biological material and solids through secondary treatment (TBELs) as addressed in **Section IV**. These limits are sufficient to protect water quality and no

additional WQBELs are necessary for these parameters. Monitoring for pH will increase to once a week because of exceedances during the POR and the increased monitoring will better track compliance.

The 2014 303(d) List identifies sedimentation as a cause of impairment for Upper Flint Creek not supporting aquatic life. The Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan established a sediment TMDL for Flint Creek from Georgetown Lake to the confluence with Boulder Creek. The sediment TMDL assigned the Philipsburg WWTF a wasteload allocation (WLA) for sediment loading of 11 tons/year and 0% reduction in their sediment load allocation.

This WLA is met by the TBEL load limit for TSS of 60 lbs/day (30-day average). The maximum allowable discharge of TSS from the Phillipsburg WWTF, at the facility design flow, is 10.95 tons/year. Additional limits beyond the proposed TSS load limits are not needed to meet the sediment WLA for the Philipsburg WWTF.

Total Dissolved Solids (TDS) – Upper Flint Creek is not impaired for TDS. No numeric and/or narrative water quality standards currently exist for TDS discharges to surface waters. Monitoring will be removed for Total Dissolved Solids (TDS).

Oil and Grease (O&G) – The previous permit did not include limits for O&G, but did require monitoring for this parameter. General water quality standards prohibit discharges that create a visible oil sheen, globules of grease or other floating materials, or O&G to be present in concentrations at or in excess of 10 mg/L [ARM 17.30.637(1)(b)].

Based on the POR quarterly monitoring, O&G was not present in concentrations at or in excess of 10 mg/L. Therefore, reasonable potential does not exist for exceedances in O&G narrative standards. Quarterly monitoring will be maintained with the renewal.

***Escherichia coli* (*E. coli*)** -The standards applicable for *E. coli* to a B-1 receiving surface water are:

- April 1 through October 31 of each year - the geometric mean number of *E. coli* must not exceed 126 colony forming units (cfu) per 100 milliliters (mL) and 10% of the total samples may not exceed 252 cfu per 100 ml during any 30-day period [ARM 17.30.625(2)(a)(i)]; and
- November 1 through March 31 of each year - the geometric mean number of *E. coli* must not exceed 630 cfu per 100 ml and 10% of the total samples may not exceed 1,260 cfu per 100 ml during any 30-day period [ARM 17.30.625(2)(a)(ii)].

The previous permit includes effluent limits for *E. coli* as 30-day geometric mean and

maximum daily applied at the point of discharge. These limits will be retained in this permit renewal. The standards for *E. coli* for Upper Flint Creek apply year-round at the end of the pipe prior to discharge.

B. Non-conventional Pollutants

Dissolved Oxygen (DO) – Freshwater aquatic life standards are characterized by the fishery (cold- or warm-water) and by the presence or absence of fish early life stages. Standards are further defined based on a time frame and required DO levels. B-1 waterbody classification states the receiving waters are cold-water fisheries. DO standards for B-1 waters are provided in **Table 4**.

Table 4: B-1 Water Classification DO Standards[1]

Dissolved Oxygen	Units	30-Day Mean	7-Day Mean	7-Day Mean Minimum	1-Day Minimum[2]
Early Life Stages [3][4]	mg/L	NA[5]	9.5 (6.5)	NA	(8.0) 5.0
Other Life Stages	mg/L	6.5	NA	5.0	4.0

Footnotes:
(1) Based on Department Circular DEQ-7.
(2) All minima should be considered as instantaneous concentrations to be achieved at all times.
(3) These are water column concentrations recommended to achieve the required inter-gravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the figures in parentheses apply.
(4) Includes all embryonic and larval stages and all juvenile forms of fish to 30-days following hatching.
(5) NA – Not applicable

Upper Flint Creek is not listed as impaired for DO. The previous permit did not include limits for DO, but did require monitoring for this parameter. Philipsburg WWTF effluent failed to meet DO standards for the monthly monitoring period of August 2013. Wastewater treatment facilities following proper operation and maintenance (O&M) will provide significant removal of organic material as measured by BOD_5, but Philipsburg WWTF is under an AOC for exceeding BOD_5 standards numerous times throughout the current permit cycle. Poor BOD_5 treatment can lead to low levels of DO. Once Philipsburg WWTF upgrades are completed, DO monitoring requirements can be reevaluated. Because of future upgrades and the fact that Upper Flint Creek is not impaired for DO, no limits are required, but monitoring will be maintained for DO in the renewed permit.

Total Residual Chlorine (TRC) – The previous permit included monitoring requirements for TRC that were only applicable if chlorine was used as a disinfectant in the treatment process. The 2007 Fact Sheet explained that if chlorine disinfection was used, the WQBEL of 0.011 mg/L would apply. This limit was not transferred into the final permit. During the POR, Philipsburg WWTF did not employ chlorine disinfection. Monitoring will be maintained with this renewal. If Philipsburg WWTF

employs chlorine disinfection, average monthly and maximum daily limits will apply. These limits will be included in the final permit on a conditional basis. Philipsburg WWTF is in the process of upgrading their facility. If an ultraviolet disinfection system is installed, TRC monitoring requirements and limits will be removed.

Nitrate + Nitrite, as N – The previous permit did not include limits for nitrate + nitrite, but did require monthly monitoring for this parameter. No reasonable potential exists for exceedances of the nitrate + nitrite human health standards of 10 mg/L. Monitoring will be retained because nitrate + nitrite is a component of total nitrogen.

Total Ammonia as N - Standards for total ammonia are pH and temperature dependent. Calculations for determining the ammonia standard are outlined in the Department Circular DEQ-7. Total ammonia standards are further defined as acute one-hour average (CMC) and chronic 30-day average (CCC) criterion. The fishery present and associated life stages are also taken into consideration for ammonia standard calculations.

The 2007 Fact Sheet calculated ammonia standards using 8 samples for temperature and 6 samples for pH. These data sets were further divided into seasonal limits (summer and winter) using the 75th percentile of each data set. DEQ requires a minimum of 10 samples from the receiving water to determine the 75th percentile value. If a data set is below 10 samples, DEQ has determined that monitoring should be required to obtain background concentrations and perform reasonable potential analysis. Research for this permit renewal cycle produced increased, representative data sets of ambient conditions. Ammonia standards were recalculated with the new data sets. Water quality standards for total ammonia as N are summarized in **Table 5**.

Table 5: Ammonia Standard Calculations[1] [2]

Condition	Period	Salmonids Present	Early Life Stages Present	Ambient Condition[3]		Water Quality Standard[4] (mg/L)
				pH (s.u)	Temperature °C	

Acute	Annual	Yes	NA	8.2	NA	3.83
Chronic	Annual	NA	Yes	8.2	16	1.63

Footnotes:
(1) The receiving water temperature is based on 121 samples from the upstream USGS gauging station 12325500, Flint Creek near Southern Cross, from 2000-2013. The receiving water pH is based on 13 upstream samples from multiple locations during 2007-2009.
(2) NA – Not Applicable.
(3) Based on 75th percentile of data.
(4) Based on Montana Circular DEQ-7.

Reference **Appendix H** for ammonia calculations. No reasonable potential exists. Monitoring will be continued. A mixing zone study for ammonia will be required.

Nutrients [Total Nitrogen (TN) and Total Phosphorus (TP)] - Philipsburg WWTF is a two-cell facultative lagoon system not designed to actively remove nutrients. The Flint Creek Planning Area Nutrients TMDLs and Water Quality Improvement Plan identifies Philipsburg WWTF as a contributing source for both TN and TP impairments and assigns wasteload allocations for both TN and TP. Per the TN WLA, the WWTF will continue current operating conditions reflective of the average summer growing season load. Per the TP WLA, the WWTF has requested the General Nutrient Standards Variance as part of a staged implementation process to comply with the water quality target of 0.072 mg/L. DEQ has approved the General Nutrient Standards Variance request and the TP limits will be based on current performance at the end-of-pipe. Reference **Appendix D** for nutrient TMDL rationale, **Appendix H** for TN calculations, and **Appendix I** for TP rationale and limit calculations.

C. Toxic Pollutants (Metals) - **Table 6** and **Table 7** below display calculations for specific metals where numeric water quality standards are expressed as a function of hardness.

Table 6: Metals Acute Standard Calculations(1)

Metals	Ambient Hardness(2)	Acute = exp{ma[ln(hardness)]+ba}(3)	Acute Water Quality Standard
Cadmium	92.25 mg/L	exp{1.0166[ln(92.25 mg/L)]+3.924}	1.96 µg/L

Copper		exp{0.9422[ln(92.25 mg/L)]+-1.700}	12.97 µg/L
Lead		exp{1.273[ln(92.25 mg/L)]+-1.46}	73.68 µg/L

Footnotes:
(1) Metals are expressed as a function of total hardness (mg/L, CaCO3) of the receiving waterbody.
(2) The critical condition for hardness is determined by the 25th percentile of a data set of 12 ambient water quality samples.
(3) Variable values for **ma** and **ba** are provided from Footnote (12) of Montana Circular DEQ-7.

Table 7: Metals Chronic Standard Calculations(1)

Metals	Ambient Hardness(2)	Chronic = exp{mc[ln(hardness)]+bc}(3)	Chronic Water Quality Standard
Cadmium	92.25 mg/L	exp{0.7409[ln(92.25)]+-4.719}	0.2549 µg/L
Copper		exp{0.8545[ln(92.25)]+-1.702}	8.71 µg/L
Lead		exp{1.273[ln(92.25)]+-4.705}	2.87 µg/L

Footnotes:
(1) Metals are expressed as a function of total hardness (mg/L, CaCO3) of the receiving waterbody.
(2) The critical condition for hardness is determined by the 25th percentile of a data set of 12 ambient water quality samples.
(3) Variable values for **mc** and **bc** are provided from Footnote (12) of Montana Circular DEQ-7.

The Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan provides wasteload allocations to the Philipsburg WWTF for mercury, copper, lead, and arsenic. Reference **Appendix D** for additional TMDL information and calculations.

Mercury – The Mercury WLA_{Pburg} = 0.0000667 lb/day. Philipsburg WWTF will utilize a 20-year phased metals WLA implementation plan to achieve 0.0000667 lb/day and cap the facility at existing load. The available effluent data set (four samples) is insufficient for limit development. The WWTF will be required to provide ambient and effluent monitoring with the permit renewal. The next permit cycle will cap the facility at current performance.

Copper - The Copper WLA_{Pburg} = 0.0116 lb/day. The Copper WLA_{Pburg} is based on the facility meeting the lowest applicable metals standard concentration within the discharger's effluent. Philipsburg WWTF will utilize a 20-year phased metals WLA implementation plan and cap the facility at existing load. The available effluent data

set (four samples) is insufficient for limit development. The WWTF will be required to provide ambient and effluent monitoring with the permit renewal. The next permit cycle will cap the facility at current performance.

Lead - The Lead WLA_{Pburg} = 0.0038 lb/day. The Lead WLA_{Pburg} is based on the facility meeting the lowest applicable metals standard concentration within the discharger's effluent. Philipsburg WWTF will utilize a 20-year phased metals WLA implementation plan and cap the facility at existing load. The available effluent data set (four samples) is insufficient for limit development. The WWTF will be required to provide ambient and effluent monitoring with the permit renewal. The next permit cycle will cap the facility at current performance.

Arsenic - The Arsenic WLA_{Pburg} = 0.013 lb/day. The TMDL requires the facility to assess if the facility is able to achieve the WLA. If the WLA is unachievable, Philipsburg WWTF will utilize a 20 year phased metals WLA implementation plan and cap at existing load. The available effluent data set (four samples) is insufficient for limit development. The WWTF will be required to provide ambient and effluent monitoring with the permit renewal. The next permit cycle will assess the achievability of the WLA and cap the facility at current performance as needed.

Iron – The previous permit did not require Philipsburg WWTF to monitor for iron. Because the WWTF's load is less than 0.5% of the TMDL, the TMDL requires one yearly sample for TMDL implementation and TMDL WLA tracking purposes. Annual monitoring will be included.

Cadmium - Cadmium was delisted on 12/27/2013 as an impairment cause for Upper Flint Creek in the 2014 Integrated Report because the applicable water quality standards were attained. Cadmium is not a pollutant of concern. Philipsburg WWTF collected four samples of cadmium during 2009-2010. The highest concentration measured in a sample was 0.133 µg/L, and this concentration is below the chronic standard of 0.2549 µg/L. No reasonable potential exists. Monitoring will be removed.

Antimony - Antimony was delisted on 12/27/2013 as an impairment cause for Upper Flint Creek in the 2014 Integrated Report because the applicable water quality standards were attained. Antimony is not a pollutant of concern. Philipsburg WWTF collected four samples of antimony during 2009-2010. The highest concentration measured in a sample was 2.02 µg/L, and this concentration is below the human health standard of 5.6 µg/L. No reasonable potential exists. Monitoring will be removed.

Whole Effluent Toxicity (WET) Testing Requirements – ARM 17.30.637(1)(d) requires that state water be free from substances attributable to municipal waste that create conditions that are harmful or toxic to human, animal, plant or aquatic life,

except DEQ may allow limited toxicity in a mixing zone provided certain conditions are met.

The previous permit did not require WET testing and expanded effluent monitoring. Philipsburg WWTF is a small discharger with no industrial contributions. The composition of the influent to the Town of Philipsburg has not changed since the previous permit renewal. Typically, DEQ requires WET testing for POTWs with design flow rates greater than or equal to one million gallons per day, POTWs with approved pretreatment programs, or by DEQ's discretion based on the consideration of specific factors [ARM 17.30.1322 (12)(e)]. Per DEQ requirements, no assessment of toxicity will be required for this permit cycle.

VI. Final Effluent Limits

Final limits for Outfall 001 are effective upon the renewal date of the permit and

lasting through the duration of the permit. The effluent quality shall meet the final limits in **Table 8**.

Table 8: Final Effluent Limits for Outfall 001

Parameter[1]	Units	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--
	lbs/day	40.0	60.0	--
	% removal	85	--	--
Total Suspended Solids (TSS)	mg/L	45	65	--
	lbs/day	60.0	87.0	--
	% removal	65	--	--
E. coli bacteria [2], [4]	cfu/100mL	126	--	252
E. coli bacteria [3], [4]	cfu/100mL	630	--	1260
Total Residual Chlorine (TRC)[5][6]	mg/L	0.011	--	0.023
Total Nitrogen (TN)[7]	lbs/day	15.6	--	--
Total Phosphorus (TP)[7]	lbs/day	3.88	--	--
pH	s.u.	6.0-9.0 (instantaneous)		

Footnotes:
(1) The Required Reporting Value (RRV) for each parameter is the detection level that must be achieved in reporting surface water monitoring or compliance data to DEQ as listed in the latest revision of Circular DEQ-7.
(2) Limit applies from April 1 through October 31.
(3) Limit applies from November 1 through March 31.
(4) Report Geometric Mean if more than one sample is collected in the reporting period.
(5) Limits are only applicable for TRC if chlorine is used as a disinfectant in the treatment process.
(6) Analytical results less than 0.1 mg/L will be considered in compliance with the chlorine limit.
(7) Limit applies from July 1 through September 30.

VII. Monitoring Requirements

Monitoring of the effluent must be representative of the discharge. The effluent sample must be obtained from the end of pipe discharging from the lagoon system and the effluent discharge flow rate must be obtained from the Parshall flume. The

influent sample must be obtained at the influent manhole.

Monitoring must be conducted according to test procedures approved under 40 CFR 136 unless other test procedures have been specified in the permit. Philipsburg WWTF monitoring requirements effective upon renewal are displayed in **Table 9**.

Table 9: Monitoring Requirements

Parameter	Unit	Sample Location	Sample Frequency	Sample Type	Reporting Requirement[1][2]
Flow	mgd	Effluent	5/Week	Instantaneous	Max &Average Weekly

5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	Influent	1/Month	Composite	Average Monthly
	mg/L	Effluent	1/Week	Composite	Max Weekly & Monthly Average
	% Removal	Effluent	1/Month	Calculated	Average Monthly
	lb/day	Effluent	1/Month	Calculated	Max Weekly & Monthly Average
Total Suspended Solids (TSS)	mg/L	Influent	1/Month	Composite	Average Monthly
	mg/L	Effluent	1/Week	Composite	Max Weekly & Monthly Average
	% Removal	Effluent	1/Month	Calculated	Average Monthly
	lb/day	Effluent	1/Month	Calculated	Max Weekly & Monthly Average
Dissolved Oxygen	mg/L	Effluent	1/Month	Grab	Average Monthly
pH	s.u.	Effluent	1/Week	Instantaneous	Daily Min & Max
Temperature	°C	Effluent	1/Month	Instantaneous	Max Monthly
E. coli bacteria(3)	cfu/100mL	Effluent	1/Week	Grab	Max Weekly & Monthly Geo Mean
Total Residual Chlorine(4)	mg/L	Effluent	Daily	Grab	Max Daily & Average Monthly
Oil and Grease(5)	mg/L	Effluent	1/Quarter	Grab	Max Daily
Total Ammonia, as N	mg/L	Effluent	1/Month	Composite	Max Monthly
Total Nitrate + Nitrite, as N(7)	mg/L	Effluent	1/Month	Composite	Average Monthly
Total Kjeldahl Nitrogen(7)	mg/L	Effluent	1/Month	Composite	Average Monthly
Total Nitrogen, as TN (6)(7)	mg/L	Effluent	1/Month	Calculated	Average Monthly
	lb/day	Effluent	1/Month		
Total Phosphorus, as TP(7)	mg/L	Effluent	1/Month	Composite	Average Monthly
	lb/day	Effluent	1/Month	Calculated	
Arsenic, Total Recoverable	µg/L	Effluent	1/Quarter	Composite	Max Daily & Average Monthly
Copper, Total Recoverable	µg/L	Effluent	1/Quarter	Composite	Max Daily & Average Monthly
Lead, Total Recoverable	µg/L	Effluent	1/Quarter	Composite	Max Daily & Average Monthly
Mercury, Total Recoverable(8)	µg/L	Effluent	1/Quarter	Composite	Max Daily & Average Monthly
Iron, Total Recoverable	µg/L	Effluent	1/Year	Composite	Max Daily & Average Monthly

Footnotes:

(1) The Required Reporting Value (RRV) for each parameter is the detection level that must be achieved in reporting surface water monitoring or compliance data to DEQ as listed in the latest revision of Circular DEQ-7.
(2) Max = Maximum.
(3) Report Geometric (Geo) Mean if more than one sample is collected in the reporting period.
(4) The permittee is only required to sample for total residual chlorine if chlorine is used as a disinfectant in the treatment process. If chlorine is *not* used, write "NA" on the DMR for this parameter or NODI "9" on NetDMR.
(5) Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM), or equivalent.
(6) Calculated as the sum of Nitrate + Nitrite (as N) and Total Kjeldahl Nitrogen (as N) concentrations or measured by persulfate digestion.
(7) Monitoring applies from July 1 through September 30.
(8) Collect and analyze ultra-low level detection limit mercury in coordination with DEQ. Philipsburg is responsible for coordination with DEQ and monitoring is required regardless of coordination.

Upstream Monitoring Requirements

The permittee shall conduct monitoring in Flint Creek., upstream from the discharge point. The permittee will receive DMRs for the monitoring requirements displayed in **Table 10**. The background data collected will be used by DEQ to characterize pollutants of concern and assess RP and WQBELs during the next permit renewal.

Table 10: Upstream Monitoring Requirements[1][2]

Parameter	Unit	Sample Location	Sample Frequency	Sample Type	Reporting Requirement[3]
Nitrate + Nitrite, as N[4]	mg/L	Upstream	1/Month	Composite	Single Sample
Total Kjeldahl Nitrogen, as N[4]	mg/L	Upstream	1/Month	Composite	Single Sample
Total Nitrogen (TN) [4] [5]	mg/L	Upstream	1/Month	Calculated	Single Sample
Total Phosphorus (TP) [4]	mg/L	Upstream	1/Month	Composite	Single Sample
pH	s.u.	Upstream	1/Month	Instantaneous	Single Sample
Temperature	°C	Upstream	1/Month	Instantaneous	Single Sample
Hardness (as $CaCO_3$)	mg/L	Upstream	1/Quarter	Grab	Single Sample
Total Ammonia, as N	mg/L	Upstream	1/Quarter	Composite	Single Sample
Arsenic, Total Recoverable	µg/L	Upstream	1/Quarter	Composite	Single Sample
Copper, Total Recoverable	µg/L	Upstream	1/Quarter	Composite	Single Sample
Lead, Total Recoverable	µg/L	Upstream	1/Quarter	Composite	Single Sample
Mercury, Total Recoverable[6]	µg/L	Upstream	1/Quarter	Composite	Single Sample
Iron, Total Recoverable	µg/L	Upstream	1/Year	Composite	Single Sample

Footnotes:
(1) Upstream monitoring must occur from the same location. Permittee will identify location in comment section of DMR.
(2) The permittee should consider quarterly monitoring for metals during high flow periods as appropriate.
(3) The Required Reporting Value (RRV) for each parameter is the detection level that must be achieved in reporting surface water monitoring or compliance data to DEQ as listed in Circular DEQ-7.
(4) Monitoring applies from July 1 through September 30.
(5) Calculated as the sum of Nitrate + Nitrite (as N) and Total Kjeldahl Nitrogen (as N) concentrations.
(6) Collect and analyze ultra-low level detection limit mercury in coordination with DEQ. Philipsburg is responsible for coordination with DEQ and monitoring is required regardless of coordination.

Downstream Monitoring Requirements

The permitee shall conduct monitoring in Flint Creek, downstream from the discharge point. The permittee will receive DMRs for the monitoring requirements displayed in **Table 11**. The downstream data collected is required by the Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan as part of the phased metals WLA implementation plan.

Table 11: Downstream Monitoring Requirements[1][2]

Parameter	Unit	Sample Location	Sample Frequency	Sample Type	Reporting Requirement[3]
Arsenic, Total Recoverable	µg/L	Downstream	1/Quarter	Composite	Single Sample
Copper, Total Recoverable	µg/L	Downstream	1/Quarter	Composite	Single Sample
Lead, Total Recoverable	µg/L	Downstream	1/Quarter	Composite	Single Sample
Mercury, Total Recoverable[4]	µg/L	Downstream	1/Quarter	Composite	Single Sample

Footnotes:
(1) Downstream monitoring must occur from the same location. Permittee will identify location in comment section of DMR.
(2) The permittee should consider quarterly monitoring for metals during high flow periods as appropriate.
(3) The Required Reporting Value (RRV) for each parameter is the detection level that must be achieved in reporting surface water monitoring or compliance data to DEQ as listed in Circular DEQ-7.
(4) Collect and analyze ultra-low level detection limit mercury in coordination with DEQ. Philipsburg is responsible for coordination with DEQ and monitoring is required regardless of coordination.

VIII. Reporting Requirements

The permittee must comply with reporting requirements as specified in the permit in accordance with ARM 17.30.1342.

IX. Special Conditions/Compliance Schedule

A. General Nutrient Variance/Facility Optimization Study Requirements

Facilities that receive a nutrient variance must evaluate current facility operations to optimize nutrient reduction with existing infrastructure and analyze other cost-effective methods of nutrient load reductions. DEQ-12B allows for flexibility regarding the scope and content of the study but requires that the optimization study includes, but not be limited to, an assessment of nutrient trading feasibility within the watershed without substantial investment in new infrastructure. DEQ may request the permittee provide the results of the optimization study/nutrient reduction analysis within two years of receiving the variance.

This permit requires the completion of an optimization study/nutrient reduction analysis including an assessment of trading with a two-year compliance schedule, as summarized in **Table 12**.

Table 12: Compliance Schedule

Action	Frequency	Scheduled Completion Date of Action(1)	Report Due Date(2)
Complete a Facility Optimization Study.	Single Event	No Later than Two Years from the Effective Date of the Permit.	NA(3)

Submit Notification that the Facility Optimization Study is Complete.	Single Event	No Later than Two Years from the Effective Date of the Permit.	The 28th of the Following Month Two Years from the Effective Date of the Permit.

Footnotes:
(1) The actions must be completed on or before the scheduled completion dates.
(2) This notification must be postmarked or electronically submitted to DEQ on or before the scheduled due date.
(3) NA = Not Applicable

DEQ-12B encourages optimization studies include, but not be limited to, facility operations and maintenance, reuse, recharge, and land application. However, DEQ-12B clarifies that the changes to facility operations resulting from the analysis carried out are only intended to be refinements to the wastewater treatment system already in place, addressing changes to facility operation and maintenance. Optimizations are not intended to include changes to the facility resulting in structural modification, user rate increases, or substantial capital investment.

B. Ammonia Mixing Zone Study

The facility must perform a mixing zone study for ammonia. The mixing zone study must obtain the information necessary to predict, using modeling, the geometry and dilution characteristics of the initial mixing zone (near field mixing) and show the behavior of the discharge plume at larger distances from the discharge (far field mixing). Ambient conditions are described by the geometry of the receiving water including the shape, depth and bottom topography of the receiving stream, especially near the discharge. Other characteristics necessary for a mixing zone study are the velocity and density of the receiving water, especially near the discharge. Discharge data and conditions necessary for a mixing zone study include, but are not limited to, the geometry of the outfall configuration, and its orientation into Flint Creek and its elevation relative to the bottom of Flint Creek. Flux characteristics such as ammonia concentrations (ambient and effluent) and effluent discharge flow rates are also important. Ideally, mixing zone study data should be collected at the 7Q10 flow of the receiving stream. Seasonal ammonia mixing zones studies may be completed to account for variability.

DEQ does not require which model to use, but the two generally accepted models are Plumes and CORMIX. The selected model should provide a list of parameters or data needed to run the model and sufficiently characterize the discharge in ambient conditions.

The ammonia mixing zone study results must include information on the quantity, toxicity, and persistence of the pollutant; the rate and volume of effluent flow; the

concentration of pollutants within the mixing zone; the length of time the pollutants will be present; and the proposed boundaries of the mixing zone [ARM 17.30.518(4)]. The proposed mixing zone for ammonia must be of the smallest practicable size and protective of all beneficial uses of Flint Creek. Narrative water quality standards, standards for harmful substances, and numeric acute and chronic standards may not be exceeded beyond the boundaries of the proposed mixing zone (ARM 17.30.507).

The facility must provide the ammonia mixing zone study results by December 31, 2017. After receipt of the ammonia mixing zone study, DEQ may modify the permit [ARM 17.30.1361(1)] or use the information for the next permit renewal.

C. Inflow and Infiltration (I/I) Reduction

The facility must provide an annual report by December 31, 2016, and December 31, 2017, describing progress in planning, budgeting, and upgrading the facility to address I/I issues.

D. Sludge Removal

The facility must provide an annual report by December 31, 2016, and December 31, 2017, describing the progress in planning, budgeting, and upgrading the facility to remove sludge. In each annual report, the facility must consider and document how the use or disposal of sewage sludge is in conformance with 40 CFR 503 and how sludge removed during upgrades will be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge shall not be directly blended with or enter either the final plant discharge and/or waters of the United States.

X. Reopener Provisions

DEQ may reopen the permit to modify permit conditions and requirements. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limits (and compliance schedules, if necessary), or other appropriate requirements if one or more of the following events occurs:

- Water Quality Standards. The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit
- Water Quality Management Plan. A revision to the current water quality management plan is approved and adopted that calls for different effluent limits than contained in this permit.
- Toxic Pollutants. A toxic standard or prohibition is established under Clean Water

Act Section 307(a) for a toxic pollutant that is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit.

- TMDL or Wasteload Allocation. TMDL requirements or a wasteload allocation is developed and approved by DEQ and/or EPA for incorporation into this permit.

XI. Rationale for Standard Conditions

Standard Conditions, which apply to all MPDES permits in accordance with ARM 17.30.1342 and additional conditions applicable to specified categories of permits in accordance with ARM 17.30.1343, are included in Section III of the permit. The permittee must comply with all standard conditions under ARM 17.30.1342 and the additional conditions that are applicable to the permittee under ARM 17.30.1343.

40 CFR 123.25(a)(12) allows the State to omit or modify conditions to impose more stringent requirements. In accordance with 40 CFR 123.25, the permit omits Federal conditions that address enforcement authority specified in 40 CFR 122.41(j)(5) and (k)(2) because the enforcement authority under the ARM is more stringent. In lieu of these conditions, the permit incorporates by reference MCA 75-5-633.

XII. Public Participation

Public comments are invited any time prior to the close of the business **August 19, 2015**. Comments may be directed to:

DEQ Permitting and Compliance Division
Water Protection Bureau
PO Box 200901
Helena, MT 59620

or DEQWPBPublicNotices@mt.gov

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments and issue a final decision within sixty days of the close of the public comment period or as soon as possible thereafter.
All persons, including applicants, who believe any condition of a draft permit is inappropriate or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing) under ARM 17.30.1372.

Copies of the public notice were mailed to the Discharger, state and federal agencies and interested persons who have expressed in interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this permit. In addition to mailing the public notice, a copy of the notice and applicable draft permit, fact sheet and EA were posted on the DEQ website for 30 days.

Any person interested in being placed on the mailing list for information regarding this MPDES Permit contact DEQ, reference this Facility, and provide a name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing [ARM 17.30.1373].

XIII. Citations

1. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

2. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

3. Montana Code Annotated (MCA), Title 75-5-101, et seq., "Montana Water Quality Act,' 2011.

4. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality

5. Subchapter 2 - Water Quality Permit and Application Fees.

6. Subchapter 5 - Mixing Zones in Surface and Ground Water.

7. Subchapter 6 - Montana Surface Water Quality Standards and Procedures.

8. Subchapter 7- Nondegradation of Water Quality.

9. Subchapter 12 - Montana Pollutant Discharge Elimination System (MPDES) Standards.

10. Subchapter 13 - MPDES Permits.

11. Montana DEQ Circular DEQ-7, Montana Numeric Water Quality Standards.

12. Montana DEQ Circular DEQ-12A, Montana Base Numeric Nutrient Standards,

July 2014.

13. Montana DEQ Circular DEQ-12B, Nutrient Standard Variances, July 2014.

14. Integrated 303(d)/305(b) Water Quality Report for Montana (2014).

15. Draft, US Department of Interior Geological Survey, Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2009, Scientific Investigations Report, 2015.

16. US EPA Technical Support Document for Water Quality-Based Toxics Control, EPA/505/2-30-001, March 1991.

17. US EPA National Pollutant Discharge Elimination System (NPDES) Permit Writers'Manual, EPA 833-K-10-001, September 2010.

18. MPDES Permit Number MT0031500:
    - Administrative Record.
    - Renewal Application DEQ Form 1 and EPA Form 2A, January 2012.

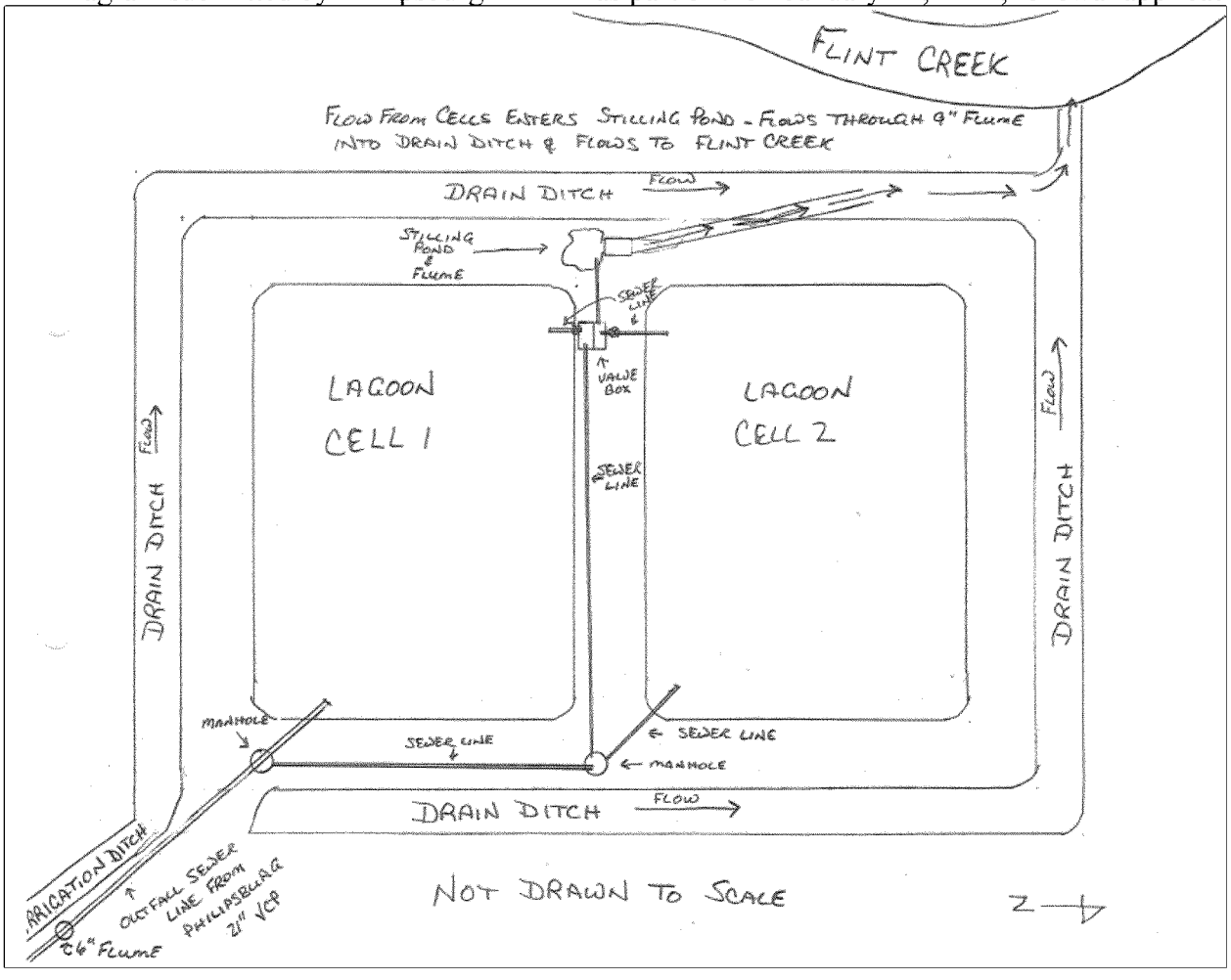
Prepared by: Carolina Davies
Date: June, 2015

Appendices

Table A.1: Current Design Criteria Summary[1][2]		
acility Description: 2-celled facultative lagoons facility, no disinfection capabilities, controlled scharge.		
Construction Date: 1961	Modification Date: 1994	
Design Population: unknown	Current Population: 820	
Design Flow, Average (mgd): 0.160	Design Flow, Maximum Day (mgd): unknown	
Primary Cells: 1	Secondary Cells: 1	
Number Aerated Cells: NA	Minimum Detention Time-System (days): 80-120	
Design BOD Removal (%): unknown	Design BOD Load (lb/day): unknown	
Design SS Removal (%): unknown	Design SS Load (lb/day): unknown	
Influent Flow (mgd): 0.14	Source: permittee	
Collection System Combined [ ] Separate [X]	Estimated I/I: 35,000 gpd[3]	
SSO Events (Y/N): no	Bypass Events (Y/N): no	
Disinfection (Y/N): no	Type: NA	
Discharge Method: Continuous		
Sludge Storage: NA	Sludge Disposal: NA	Permit Number: NA
Footnote: (1) Previous source listed as Robert Peccia and Associates, 1989. Unable to verify source information. (2) Information provided by January 12, 2012, application and per phone conversation with Public Works Director John Vukonich on June 19, 2015. (3) The estimated I/I was provided in the January 12, 2012, application with the explanation that Philipsburg WWTF plans on slip lining the outfall line to the lagoon as part of their required upgrades.		

Appendix B: Flow Diagram for the Town of Philipsburg WWTF

Diagram submitted by Philipsburg WWTF as part of their January 13, 2012, renewal application.



Appendix C: Receiving Water

The 2007 Fact Sheet used the EPA computer program DFLOW to calculate the 7Q10 flow for Flint Creek with 30 years of streamflow data from the USGS gauging station located as Flint Creek near Maxville (12329500). This 2007 analysis resulted in an approximate 4% difference of the 7Q10 (USGS 7Q10 = 25.5 cfs and DFLOW 7Q10 = 26.6 cfs) from the previous permit cycle. EPA recommends using the USGS value when differences occur between the values. Since the 2007 permit issuance, the USGS has developed the Draft "Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2009" and the most current streamflow data for the USGS gauging station 12329500 indicates that the 7Q10 is 24.9 cfs. The 7Q10 was calculated with 67 years of historical streamflow data from the period of record 1942-2009. Therefore, the 7Q10 for Flint Creek is revised to reflect the most current USGS calculation (24.9 cfs or 16.1 mgd).

Appendix D: Total Maximum Daily Loads (TMDLs)

A TMDL is the maximum amount of a pollutant a waterbody can receive and still meet water quality standards. TMDLs provide an approach to improve water quality so that streams and lakes can support and maintain their state-designated beneficial uses. TMDL development in Upper Flint Creek included narrative standards applicable to sediment impairments and numeric standards applicable to metals impairments. Also, numeric standards are applicable to nutrient impairments. An overview of the applicable TMDLs is located in the table below.

Table D.1: Upper Flint Creek TMDLs and Wasteload Allocations[1,2]

Impairment Cause	TMDL Approval Date	WLA	Rationale
Sedimentation/ Siltation	10/2012	WLA is for a sediment load allocation = 11 tons/year and 0% reduction.	Based on current load in 2007 permit. Any other TSS permit conditions are still required.
Mercury	10/2012	WLA_{Pburg} = 0.0000667 lb/day[3]	Calculated using the human health standard of 0.05 µg/L.
Copper[4]	10/2012	WLA_{Pburg} = 0.0116 lb/day[3]	Based on meeting the lowest applicable metals standard concentration (8.71 µg/L) within the discharger's effluent.
Lead[4]	10/2012	WLA_{Pburg} = 0.0038 lb/day[3]	Based on meeting the lowest applicable metals standard concentration (2.87 µg/L) within the discharger's effluent.
Arsenic	10/2012	WLA_{Pburg} = 0.013 lb/day[3]	Calculated using the human health standard of 10 µg/L.
Total Phosphorus[5]	12/2013	WLA_{TP} = (X) (Y) (5.4)	Based on a discharge concentration equal to the nutrient target concentration multiplied by the WWTF discharge flow. Staged implementation required because the limits of technology for wastewater treatment effluent.
Total Nitrogen[6]	12/2013	WLA_{TN}= continue current operating conditions during the summer growing season	The WWTF is not contributing to TN impairment in the upstream segment, and it is a relatively small percentage of the overall TN load.

Footnotes:

1. Antimony and cadmium were both delisted on 12/27/2013, as an impairment cause for Upper Flint Creek in the 2014 Integrated Report because the applicable water quality standards were attained according to new assessment methods.
2. Lower Flint Creek is listed as impaired for iron with future monitoring needed. The TMDL states, "Because iron conditions in Philipsburg's effluent do not have reasonable potential for contribution to iron impairment and loading from this source is less than 0.5 % of the TMDL, iron monitoring beyond one yearly sample is not necessary for TMDL implementation and TMDL WLA tracking purposes."
3. Calculated using the design flow of 0.16 mgd.

Ambient hardness required to determine water quality standards. Ambient hardness is 92.25 mg/L.

5. Lower Flint Creek, the segment of Flint Creek from Boulder Creek to mouth, is impaired by TP with Philipsburg WWTF identified as a contributing source. Staged implementation required by Upper Flint Creek TMDL will meet the intention of the Lower Flint Creek TMDL.
6. Upper Flint Creek is meeting the targets for TN; therefore no WLA is necessary for that segment. Lower Flint Creek is impaired by TN and does require a TN WLA. Philipsburg WWTF is identified as a contributing source of TN in Lower Flint Creek.

Sediment TMDL

The Wasteload Allocation (WLA) for the Philipsburg WWTF is based on the current load limit in the 2007 Permit. The WLA is calculated using the facility design capacity of 0.16 mgd (0.25 cfs) and the 30-day average TSS permit concentration limit of 45 mg/L. This equates to 60 lbs/day, or approximately 11.0 tons/year and a 0% reduction in their sediment load allocation. The 30-day TSS concentration provides the most representative account for calculating the acceptable yearly load. Also, the sediment TMDL focuses on inorganic material from watershed erosion processes whereas the TSS load from the Philipsburg WWTF is mainly organic material. Any other TSS conditions of the permit must still be met in addition to the WLA such as percent removal requirements.

Metals TMDLs

The Metals TMDLs provided are based upon protecting the most sensitive use for a particular metal and thus protect all other uses. Depending upon the metal of concern, human health standards and aquatic life standards are the most sensitive use for the metals of concern. Metals TMDLs will apply to any point along the continuum of the waterbody, with some exceptions for mixing zones, and therefore protect uses along the entire stream.

For metals with numeric criteria, the most protective established state numeric water quality criteria as defined in Montana Circular DEQ-7 is adopted as the water quality target. Numeric criteria apply to both human health and aquatic life protection. The numeric aquatic life criteria for most metals are dependent upon water hardness values: usually, as the hardness increases, the water quality criteria for a specific metal increase. Acute and chronic toxicity aquatic life criteria are designed to protect aquatic life uses, while the human health standard is designed to protect drinking water uses.

The Metals TMDLs are based on the most stringent applicable water quality criteria, the 25th percentile of seasonal water hardness if applicable, and the stream flow. With most metals, the chronic aquatic life criteria, which depend upon hardness, will be used to calculate the TMDL. Under high hardness conditions however, the human health criteria for lead may apply). In the case of arsenic and mercury, the human health criteria will be used for the basis of the TMDLs, as it is the most stringent standard. Because stream flow and hardness vary seasonally, the TMDL is expressed not as a static value, but as an equation. The Metals TMDL under a specific flow condition is calculated using the following formula:

TMDL = (X) (Y) (k)
TMDL = Total Maximum Daily Load in lbs/day
X = lowest applicable metals water quality target in ug/L
Y = streamflow in cubic feet per second
k = conversion factor of 0.0054

Metals TMDLs are allocated to point (wasteload) and nonpoint (load) sources. The Metals TMDLs are comprised of the sum of all significant point and nonpoint metals sources (natural and anthropogenic), plus a margin of safety that accounts for uncertainties in loading and receiving water analyses. In addition to metals load allocations, the TMDLs must also take into account the seasonal variability of metals loads and adaptive management strategies in order to address uncertainties inherent in environmental analyses. These elements are combined in the following equation:

TMDL = $\sum$WLA + $\sum$LA + MOS
WLA = Wasteload Allocation or the portion of the TMDL allocated to metals point sources
LA = Load Allocation or the portion of the TMDL allocated to nonpoint metals sources and natural background
MOS = Margin of Safety or an accounting of uncertainty about the relationship between metals loads and receiving water quality

Metals source load allocations are provided for naturally occurring metals sources, abandoned mining sources, and permitted National Pollutant Discharge Elimination System (NPDES) point-source discharges. The WLA is based on meeting the lowest applicable metals standard concentration within the discharger's effluent. The wasteload allocation under a specific discharge flow is calculated using the following formula:

WLA_{NPDES} = (X) (Y) (k)
WLA = Wasteload Allocation to NPDES- permitted discharges in pounds per day
X = Lowest applicable metals water quality target in ug/L (for a specific in-stream hardness value)
Y = Wastewater treatment plant discharge design flow in mgd
k = Conversion factor of 0.00834

MPDES discharges permitted by the DEQ are provided a wasteload allocation. In the case of publicly owned treatment works (POTWs), permit limitations, standards, or prohibitions must be calculated based on design flow [ARM 17.30.1345(2)(a)]. The **WLA_{NPDES}** formula was updated to reflect the variable **Y** as design flow per permitting requirements. This update meets the intent of the TMDLs with ultimately achieving the lowest applicable metals standard concentration in the discharger's effluent.

Metals load allocations consist of a composite wasteload allocation to abandoned mining

sources, a wasteload allocation to the Town of Philipsburg WWTF, and a load allocation to naturally-occurring metals sources. A margin of safety is implicit in this allocation scheme, through a variety of conservative assumptions. The Metals TMDLs for Upper Flint Creek are therefore the sum of the two wasteload allocations and the load allocation to naturally-occurring sources:

$\mathbf{TMDL_{UFlint}} = \mathbf{LA_{nat} + WLA_{abmine} + WLA_{Pburg}}$

LA_{nat} = Load allocation to naturally occurring sources in the watershed

WLA_{abmine} = Composite wasteload allocation to all non-permitted abandoned mining sources in the watershed

WLA_{Pburg} = Wasteload allocation to Town of Philipsburg permitted WWTF

WLA_{Pburg}s are calculated using the formula (reference above): $\mathbf{WLA_{NPDES} = (X)\ (Y)\ (k)}$. Specific metal WLAs are further discussed below.

Mercury

The Mercury WLA for the Town of Philipsburg shall implement the following phased approach:

1. Collect and analyze ultra-low detection limit mercury samples in coordination with DEQ in the effluent and upstream of the effluent discharge. Philipsburg will be responsible for the efforts in coordinating with DEQ. If Philipsburg does not coordinate with DEQ, monitoring will still be required.

2. Collaborate with DEQ to determine increased certainty associated with sampling indicates a mercury problem in the effluent or in Upper Flint Creek.

3. Follow the same phased approach for Copper and Lead WLAs. For the phased metals WLA implementation, the Town of Philipsburg has 20 years to achieve the WLA at levels consistent with discharge flow times the TMDL target concentration. During that time period, the WLA is to be capped at existing load and the WWTF facility must provide quarterly water quality and flow data for Upper Flint Creek above and below the WWTF discharge, with focus on ensuring that yearly high flow sampling is included. The WLA can be modified prior to the end of the 20 year period if a comprehensive remediation plan is developed and implemented to create assimilative capacity (dilution) within Upper Flint Creek and/or site specific standards are adopted.

The Flint Creek Planning Area Sediment and Metals TMDLs and Framework Water Quality Improvement Plan states:

Although there is well documented mercury contamination within the watershed,

there is a level of uncertainty associated with the mercury TMDLs that should be strengthened. Lower level mercury analysis using clean sampling techniques should be conducted across the Flint Creek Watershed. This is especially stressed in respect to Philipsburg WWTF effluent and upper Flint Creek. The mercury data used to assess existing effluent conditions and upstream conditions is less certain than desirable. New data collection may prove Philipsburg is meeting their Mercury WLA.

The Mercury WLA is calculated using the human health standard of 0.05 µg/L.
The Mercury WLA is calculated as follows:

WLA_{Pburg} = (X) (Y) (k) = (0.05 µg/L) (0.16 mgd) (0.00834) = 0.00006672 lb/day

Philipsburg WWTF collected four samples for mercury during 2009-2010. Based on these samples, the facility's effluent exceeded the human health standard once (0.06 µg/L). The available data set is insufficient for limit development because a minimum of 10 samples is needed to provide a representative data set that accounts for variability. Effluent monitoring is needed to assess if Philipsburg is meeting their Mercury WLA and cap the WWTF at current performance as needed. This permit renewal will require the ambient and effluent monitoring. The next permit cycle will cap at current performance as needed. DEQ has determined that required ambient and effluent monitoring to calculate the existing load and future capping of the calculated existing load (as needed) meets the intention of the phased metals WLA implementation plan.

Copper and Lead

The Lead WLA and Copper WLA are calculated using the chronic aquatic life standard. Lead and copper water quality standards are hardness dependent. Lead and Copper WLAs provide a phased implementation approach as follows:

1. The existing WWTF copper and lead loads represent less than ½ of a percent of the allowable copper and lead loads (i.e., less than ½ percent of the TMDL). The WWTF is not a significant source of copper or lead.

2. Impairment conditions only exist in the receiving water (Flint Creek) during high flow conditions. During lower and baseflow conditions, there is assimilative capacity and the WWTF discharge does not contribute to impairment.

3. The elevated copper and lead loads originate from root deterrent treatment, leaching from pipes and from infiltration of contaminated groundwater into the WWTF collection system.

4. The extent of achievable remediation is unknown within the upstream tributaries and within Flint Creek. Adaptive management, as it relates to future copper and lead target concentrations, could result in site specific standards or some other

modification to the copper and/or lead targets. This type of modification would change the current basis for setting the WLA. Therefore, the final WWTF copper and lead treatment determinations should be based on a watershed–scale remediation plan that evaluates all contributing sources, natural background conditions, and achievable in-stream concentrations after implementing all reasonable remediation and restoration activities.

For the phased metals WLA implementation, the Town of Philipsburg has 20 years to achieve the WLA at levels consistent with discharge flow multiplied by a concentration limit based on the TMDL target concentration. During that time period, the WLA is to be capped at existing load and the WWTF facility must provide quarterly water quality and flow data for Upper Flint Creek above and below the WWTF discharge, with focus on ensuring that yearly high flow sampling is included. Upstream and downstream quarterly water quality monitoring requirements for the phased metals WLA implementation are displayed in **Table 10** and **Table 11**. Active USGS gauging stations are located upstream and downstream of Philipsburg WWTF's point of discharge. For future permitting purposes, these stations provide the necessary flow data and are readily accessible at www.usgs.gov. This data meets the intent of the TMDL to correlate impairments for metal concentrations with flow patterns.

The WLA can be modified prior to the end of the 20 year period if a comprehensive remediation plan is developed and implemented to create assimilative capacity (dilution) within Upper Flint Creek and/or site specific standards are adopted.

The Copper WLA is calculated using the chronic aquatic life criteria of 8.71 µg/L.

The Copper WLA is calculated as follows:

WLA_{Pburg} = (X) (Y) (k) = (8.71 µg/L) (0.16 mgd) (0.00834) = 0.011622624 lb/day

The Lead WLA is calculated using the chronic aquatic life criteria of 2.87 µg/L.

The Lead WLA is calculated as follows:

WLA_{Pburg} = (X) (Y) (k) = (2.87 µg/L) (0.16 mgd) (0.00834) = 0.003829728 lb/day

Philipsburg WWTF collected four effluent samples for both copper and lead during 2009-2010. The available data set is insufficient for limit development because a minimum of 10 samples are needed to provide a representative data set that accounts for variability. Effluent monitoring is needed for both lead and copper to assess if Philipsburg is meeting their Copper and Lead WLAs and cap the WWTF at current performance as needed. This permit renewal will require the ambient monitoring for both copper and lead and effluent sampling for both copper and lead. The next permit cycle will cap at current

performance as needed. DEQ has determined that required ambient and effluent monitoring to calculate the existing loads and future capping of the calculated existing loads (as needed) meets the intention of the phased metals WLA implementation plan.

Arsenic

The Arsenic WLA is calculated using the human health standard of 10 µg/L.

WLA_{Pburg} = (X) (Y) (k) = (10 µg/L) (0.16 mgd) (0.00834) = 0.013344 lb/day

Philipsburg WWTF collected four samples for arsenic during 2009-2010. Based on these samples, the facility's effluent exceeded the human health standard once (14.6 µg/L). The available data set is insufficient for limit development because a minimum of 10 samples is needed to provide a representative data set that accounts for variability. Effluent monitoring is needed to assess if Philipsburg is meeting their Arsenic WLA and cap the WWTF at current performance as needed. This permit renewal will require ambient and effluent monitoring. The next permit cycle will cap at current performance as needed. If Phillipsburg is not meeting their Arsenic WLA, the WWTF will follow the same phased approach for Copper and Lead WLAs. DEQ has determined that required ambient and effluent monitoring to calculate the existing load and future capping of the calculated existing load (as needed) meets the intention of the phased metals WLA implementation plan.

Nutrient TMDLs

Upper Flint Creek (Georgetown Lake to confluence with Boulder Creek) is listed in the 2014 Integrated Report (IR) 2014 as impaired for nutrients. Potential nutrient sources within the impaired segments include natural, livestock, agriculture, septic systems, municipal wastewater (Philipsburg WWTF), mining, and timber harvest. Lower Flint Creek (Boulder Creek to mouth) identifies Philipsburg WWTF as a contributing source to impairments in its reach. Assessment of existing nutrient (i.e., nitrate, nitrogen, and phosphorus) sources was used to develop load allocations to specific source categories.

Source characterization links nutrient sources, nutrient loading to streams, and water quality response, and supports the formulation of the load allocation portion of the TMDL. TP and TN water quality targets are applicable during the summer growing season for algae (i.e., July 1 – September 30). Consequently, source characterizations are focused mainly on sources and mechanisms that influence nutrient contributions during this period. Loading estimates and load allocations are established for the summer growing season time period and are based on observed water quality data and flow conditions measured during this time period.

TMDL calculations TP and TN are based on the following formula:

TMDL = (X) (Y) (5.4)
TMDL = Total Maximum Daily Load in lbs/day
X = Water quality target
Y = Streamflow in cubic feet per second
5.4 = Conversion factor

The TMDL is not static, as flow increases, the allowable (TMDL) load increases.

Wasteload allocations for Upper and Lower Flint Creek assessment units will consist of a composited load allocation for all nonpoint sources, including natural background sources, and a wasteload to the Philipsburg WWTF.

TMDL = LA + WLA
LA = Composite Load Allocation to all nonpoint sources and natural background sources
WLA = Wasteload Allocation to the WWTF (Upper and Lower Flint Creek)

For a WWTF, a discharge concentration must be less than or equal to an applicable numeric water quality standard if the reach immediately upstream where the discharge occurs is already exceeding the standard. If the reach immediately upstream of the WWTF discharge is determined to be unimpaired for TP and/or TN, the WLA will be modified based on a mass-balance approach if there is sufficient assimilative capacity in the receiving water.

Total Phosphorus

The reach of Flint Creek immediately upstream of the Philipsburg WWTF discharge is impaired for TP, but not TN based on application of DEQ's nutrient assessment methodology. To ensure the Philipsburg WWTF discharge does not cause or contribute to a violation of water quality standards, the WLA for TP in Upper Flint Creek is based on a discharge concentration equal to the nutrient target concentration (0.072 mg/L) multiplied by the WWTF discharge flow. Therefore, the resulting nutrient WLA for TP is based on the following equation:

WLA_{TP} = (X) (Y) (5.4)
WLA_{TP} = Total Phosphorus Wasteload Allocation in lbs/day
X = Water quality target for DEQ-12A (0.072 mg/L)
Y = WWTF discharge in cubic feet per second
5.4 = Conversion factor

WLA_{TP} = (X) (Y) (5.4) = (0.072mg/L) (0.25 cfs) (5.4) = 0.10 lb/day

The WLA is not static, as flow increases the WLA increases.

The Flint Creek Planning Area Nutrients TMDLs and Water Quality Improvement Plan states:

> *For the purpose of setting MPDES discharge permit conditions, the above equation [WLA_{TP}=(X) (Y) (5.4)] is always satisfied if the discharge concentration is equal to or less than the target concentration of 0.072 mg/L. Therefore, the permit WLA can be satisfied by applying a concentration-based requirement on the discharge of 0.072 mg/L as opposed to establishing a load. If a concentration-based approach is not used for MPDES permit integration, then the WLA should be based on the target concentration multiplied by the existing WWT(F) discharge flow... Using a concentration-based approach does not result in a load cap and can be used to simplify MPDES permit development. The nutrient target concentration is lower than current limits of technology for treatment of wastewater effluent, which will require staged implementation.*

Philipsburg WWTF cannot comply with the WLA_{TP}. The average TP discharge for the period of record (summer growing season) from July, August, and September for 2010-2014 is 2.23 lbs/day. The TP WLAs for the Philipsburg WWTF defined in this document allow staged implementation consistent with the variance process (reference **Appendix I**). Philipsburg WWTF will have 20 years from the time they receive the variance to meet the numeric nutrient standards. Staged implementation will no longer be necessary once: 1) the WWTF is able to meet their WLA value (i.e., discharge concentrations less than or equal to the targets), or 2) Flint Creek gains assimilative capacity and the WWTF meets the mixing zone allowance requirements for TP treatment.

Lower Flint Creek is impaired for TP with a water quality target of 0.03 mg/L. Upper and Lower Flint Creek are located in the Middle Rockies ecoregion with base numeric nutrient standards for TP of 30 µg/L (0.03 mg/L). Upper Flint Creek is located within an individual reach with specific standards for TP of 72 µg/L (0.072 mg/L). Therefore, TP standards become more stringent from Upper Flint Creek to Lower Flint Creek. The TMDL for Lower Flint Creek assigns a wasteload allocation for Philipsburg WWTF even though the facility discharges to Upper Flint Creek. Upper Flint Creek and Lower Flint Creek are hydrologically connected and Lower Flint Creek is sensitive to upstream pollutant contributors. The TP TMDL for Lower Flint Creek assigns a WLA for Philipsburg WWTF that accounts for the facility meeting the water quality target in Upper Flint Creek (0.072 mg/L). The Lower Flint Creek WLA_{TP} is derived from the same equation as the Upper Flint Creek WLA_{TP}.

WLA_{TP} = (X) (Y) (5.4)
WLA_{TP} = Total Phosphorus Wasteload Allocation in lbs/day
X = Water quality target from DEQ-12A (0.072 mg/L)
Y = WWTF discharge in cubic feet per second
5.4 = Conversion factor

WLA_{TP} = (X) (Y) (5.4) = (0.072mg/L) (0.25 cfs) (5.4) = 0.10 lb/day
Philipsburg WWTF cannot comply with the Lower Flint Creek WLA_{TP}, as well as the Upper Flint Creek WLA_{TP}, because of the limits of technology. The average TP discharge for the period of record (summer growing season) from July, August, and September for 2010-2014 is 2.23 lbs/day. The facility has requested a general variance for lagoons not actively designed to remove nutrients as part of the staged implementation process for the Upper Flint Creek WLA_{TP}. The granted general variance will apply to both the Upper Flint Creek WLA_{TP} and the Lower Flint Creek WLA_{TP} because both WLA_{TP}s are derived from the same equation, apply standards for Upper Flint Creek, and meet the intention of both Upper Flint Creek and Lower Flint Creek TMDLs.

Total Nitrogen

Upper Flint Creek (from Georgetown Lake to confluence with Boulder Creek) is meeting the targets for TN; therefore no WLA is necessary for that segment and water quality standards are still applicable. Lower Flint Creek (from Boulder Creek to mouth) is impaired by TN and does require a TN WLA. Because the WWTF is not contributing to TN impairment in the upstream segment, and it is a relatively small percentage of the overall TN load, the TN WLA for Lower Flint Creek is based on the WWTF continuing current operating conditions with the goal of achieving their current average summer growing season load (lbs/day). The TN limits for Philipsburg WWTF for the months of July 1- September 30 are calculated below:

Table D.2: Total Nitrogen Cap at Current Performance Limit Calculations

Parameter	Units	CV	Chronic Long Term Average(1)	AML Multiplier(2)	Final AML	Mass Based Limits(3)
Nitrogen, total as N	mg/L	0.7	7.07	1.65	11.7	15.6 lbs/day

Footnotes:
1. The average concentration from DMR data was used as the LTA to cap at current performance per assigned WLA.
2. The Average Monthly Load Multiplier was determined using standard procedures as defined in the TSD.
3. Limits are only applicable July 1 through September 30.

Appendix E: Mixing Zone

A mixing zone is granted on a parameter-by-parameter basis [ARM 17.30.505(1)], and must be of the smallest practicable size, have a minimum effect on water uses, and have definable boundaries [Montana Code Annotated (MCA) 75-5-301(4)]. Mixing zones are not granted for TBELs, Effluent Limitations Guidelines (ELGs), or other technology-based standards.

A mixing zone is a limited area of a surface waterbody or a portion of an aquifer, where initial dilution of a discharge takes place and where water quality changes may occur and where certain water quality standards may be exceeded [ARM 17.30.602(14)]. No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Narrative water quality standards, standards for harmful substances, numeric acute and chronic standards for aquatic life, and standards based on human health must not be exceeded beyond the boundaries of the surface water mixing zone [ARM 17.30.507(1)(a)].

In accordance with ARM 17.30.507(1)(b), acute water quality standards for aquatic life may not be exceeded in any portion of the mixing zone unless DEQ finds that allowing minimal initial dilution will not threaten or impair existing beneficial uses. The discharge must also comply with the general prohibitions of ARM 17.30.637(1) which require that state waters, including mixing zones, must be free from substances which will:

- settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
- create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
- produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
- create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
- create conditions which produce undesirable aquatic life.

The 2007 permit calculated ammonia with a dilution ratio of 100% of the 7Q10 to the acute and chronic mixing zone for ammonia. DEQ granted Philipsburg WWTF a standard mixing zone based on the facility discharging less than one million gallons per day to a stream segment with a dilution ratio greater than or equal to 100:1 [ARM 17.30.516(3)(a)]. The current dilution ratio is 100:1 (7Q10 of 16.1 mgd: design flow of 0.16 mgd). The facility experiences substantial fluctuations in their discharge flow rates with the maximum discharge flow rate of 0.47 mgd (3

times the design flow) during the period of record. These fluctuations above the design flow result in decreased dilution ratios of the 7Q10. Philipsburg WWTF has not previously completed a mixing zone study for ammonia to account for the discharge plume fluctuations. The definable boundaries of the ammonia mixing zone are 280 feet downstream of the discharge and the mixing zone width has not been determined.

Any previously allowed mixing zone will remain designated in a renewed permit, unless there is evidence that the previously allowed mixing zone will impair existing or anticipated uses [ARM 17.30.505(1)(c)]. DEQ will apply the previously granted mixing zone for the permit renewal, but Philipsburg WWTF will be required to complete a mixing zone study for ammonia as a special condition for the permit renewal. The mixing zone study will provide the needed information to determine if the previously granted mixing zone is of the smallest practicable size and does not have the potential to impair beneficial uses. Also, the mixing zone study will define the boundaries for both length and width downstream. DEQ may use the ammonia mixing zone study to either modify an existing permit or, during the next permit renewal, to determine if an alternative or modified mixing zone, as defined by DEQ, is more appropriate than a standard mixing zone.

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Appendix F: Rationale for TBELs

Scope and Authority

TBELs represent the minimum level of control that must be imposed by a permit issued under the MDPES program, as stated at 40 CFR 122.44(a) and adopted by reference in ARM 17.30.1203(1). DEQ must consider technology available to treat wastewater, and limits that can be consistently achieved by that technology. TBELs are based on currently available treatment technologies and allow the permittee the discretion to choose applicable controls to meet those standards.

The Montana Board of Environmental Review (BER) has adopted general treatment requirements that establish the degree of wastewater treatment required to restore and maintain the quality of surface waters. This rule states that the degree of wastewater treatment is based on the surface water quality standards; the state's nondegradation policy; present and anticipated beneficial uses of the receiving water; the quality and flow of the receiving water; the quantity and quality of sewage, industrial wastes and other wastes to be treated; and the presence or absence of other sources of pollution on the same watershed [ARM 17.30.635(1)].

TBELs – Concentration-Based Calculations

The BER has adopted by reference 40 CFR 133 which defines minimum level of effluent quality attainable through the application of secondary treatment, or the equivalent, for publicly-owned treatment works (POTW) [ARM 17.30.1203(14)(a)]. Secondary treatment is defined in terms of effluent quality as measured by BOD_5, TSS, percent removal of BOD_5 and TSS, and pH. TBELs are based on currently available treatment technologies and allow the permittee the discretion to choose applicable controls to meet those standards.

These requirements may be modified on a case-by-case basis for facilities that are eligible for treatment equivalent to secondary (TES) treatment [40 CFR 133.101(g)] or alternative state requirements (ASR) for TSS. To determine if a facility is eligible for TES the facility must meet the requirements of 40 CFR 133.101(g), summarized as follows:

The BOD_5 and TSS concentrations consistently achievable through proper operation and maintenance of the treatment works exceed the minimum effluent quality described for secondary treatment [40 CFR 132.102]; the treatment works utilize a trickling filter or waste stabilization pond; and the treatment works utilizes biological treatment that consistently

achieves a 30-day average of at least 65 percent removal [40 CFR 133.101(k)].

Water quality must not be adversely affected by the application of treatment equivalent to secondary treatment. Effluent limits for BOD_5 cannot be relaxed unless the permittee has demonstrated that the relaxed limits will not result in a violation of water quality standards in the receiving water.
In addition to TES, permitting agencies may give special consideration to treatment works that employ waste stabilization ponds as the primary method for treating wastes. ASR may be incorporated into permits for lagoons if historic data for the system indicates that effluent limits based on TES cannot be achieved. The 30-day ASR for TSS in Montana is 100 mg/L (49 FR 37005; September 20, 1984); DEQ employed a 135 mg/L TSS for a 7-day limit based on best professional judgment. ASR limits may be incorporated as seasonal limits. New facilities are not eligible for ASR.

In the 2007 permit, the BOD_5 effluent limits were based on national secondary treatment standards (NSS). Philipsburg was not able to meet the NSS for BOD_5 during the POR. Philipsburg exceeded the average monthly limit 8 times, average weekly limit 6 times, and percent removal 15 times. Philipsburg WWTF is currently in a state of disrepair with required sludge removal and upgrades per an AOC to return to compliance. DEQ will not consider TES or ASR because Philipsburg WWTF conditions do not reflect proper operation and maintenance (O&M). BOD_5 limits will remain the same with the permit renewal.

In the 2007 permit, TSS effluent limits were based on TES. Philipsburg was not able to meet the TES for TSS during the POR. Philipsburg WWTF exceeded the average monthly limit 6 times, weekly average limit 8 times, and percent removal 5 times. DEQ will not consider ASR because Philipsburg WWTF conditions do not reflect proper O&M and the facility will be upgraded per their AOC. TSS limits will remain the same with the permit renewal.

When Philipsburg WWTF is upgraded, DEQ will review the applicability of secondary treatment standards for POTWs and may revise permit limits. If Philipsburg is upgraded to a mechanical plant, the plant will only be eligible for NSS for BOD_5 and TSS.

TBELs – Mass-Based Calculations

ARM 17.30.1345 [40 CFR 122.45(f)(1)] requires that effluent limits must be expressed in terms of mass (mass/time), except for certain conditions, such as pH or temperature. For municipal treatment plants, mass-based limits are based on design flow for the facility.

The design flow rate (0.16 mgd) is used for mass-based limit calculation. Mass based limits are calculated as follows:

Load (lbs/day) = Design Flow (mgd) x Concentration (mg/L) x Conversion Factor (8.34)

BOD_5:

30-d	Load = 0.16 mgd x 30 mg/L x 8.34	=	40.0 lb/day
7-d	Load = 0.16 mgd x 45 mg/L x 8.34	=	60.0 lb/day

TSS:

30-d	Load = 0.16 mgd x 45 mg/L x 8.34	=	60.0 lb/day
7-d	Load = 0.16 mgd x 65 mg/L x 8.34	=	87.0 lb/day

These mass-based limits are displayed in **Table 2**.

Appendix G: Rationale for Nondegradation Load Allocations

Nondegradation load allocations for BOD_5 are calculated using design flow and expressed in terms of mass. The design flow rate remains unchanged at 0.16 mgd. Nondegradation load allocations are calculated as follows:

Load (lbs/day) = Design Flow (mgd) x Concentration (mg/L) x Conversion Factor (8.34)

BOD_5:

30-d Load = 0.16 mgd x 30 mg/L x 8.34 = 40.0 lb/day

TSS:

30-d Load = 0.16 mgd x 100 mg/L x 8.34 = 133 lb/day

Nondegradation threshold values for Philipsburg WWTF were calculated for total nitrogen (TN) and total phosphorus (TP) as part of the previous permit renewal under the General Permit for Domestic Sewage Treatment Lagoons (MTG580005). Philipsburg WWTF received an individual permit in 2007 and this Fact Sheet is for the renewal of the 2007 permit. DEQ received an EPA comment for the 2007 permit addressing removal of nondegradation load allocation for TN and TP as removal of limits "by default" because according to the September 21, 2000, Consent Decree in the Friends of the Wild Swan, there can be no increase in the permitted discharge. DEQ responded to this comment with the explanation that TN and TP nondegradation load allocations were not based on water quality standards or impact to receiving water. DEQ was not able to analyze reasonable potential and amended the permit cycle to reflect the nondegradation load as a final 30-day effluent limit. Therefore, the 2007 permit renewal included TN and TP nondegradation load allocations removal expressed specifically in the fact sheet only, and TN and TP limits in the permit that were meant to reflect the nondegradation load allocations. Defaulting load allocations into permit limits is not a DEQ standard permit development practice. Further clarification was not provided to ascertain if the TN and TP nondegradation load allocations were actually removed with default permit limits in the response to comments for the 2007 permit renewal.

Since the previous permit development period, DEQ has further recognized that these TN and

TP load allocations were calculated using the Department of Health and Environmental Sciences memorandum (DHES, October 1994) and not based on the criteria in ARM 17.30.715 or water quality standards. The DHES memorandum provided draft guidelines for calculating nondegradation load limits for existing POTWs under the Nondegradation Rules [ARM 16.20.707(16)(a)] that were based on engineering standards and not permitting standards. Total Nitrogen and Phosphorus load calculations relied on an equivalent design population (based on the average design BOD_5 divided by the standard per capita BOD_5 contribution 0.17 lb/cd), multiplied by per capita representative nutrient contributions (derived from unsubstantiated literature where typical removal averages 30 percent). The DHES memorandum is now considered inaccurate and obsolete regarding permit development.

In August 2014, DEQ adopted water quality standards for nutrients, and TN and TP will be further discussed with water quality based effluent limits which account for Flint Creek Nutrient TMDLs and assigned WLAs. This fact sheet and permit renewal will explicitly remove TN and TP nondegradation load allocations. DEQ proposes to replace both TN and TP limits (that reflect the previous nondegradation load allocations) with this permit renewal and calculate permit limits based on water quality standards. As part of the WQBEL development, DEQ proposes more stringent mass-based limits for both TN and TP. Proposed TN current performance based limit is 15.6 lb/day for the summer growth season which is more stringent than the current limit of 40.8 lb/day. Proposed TP variance is 3.88 lb/day for the summer growth season which is more stringent than the current limit of 10.2 lb/day. Both TN and TP current limits are applicable to the summer growth season only.

DEQ contends that the removal of nondegradation load allocations meets the allowable exception under 40CFR§122.44(l)(2)(i)(B)(2) and meets the intent of CWA§402(o).

In addition, the 2013 renewal of the General Permit for Domestic Sewage Treatment Lagoons determined that TN and TP nondegradation load allocations, calculated for permittees with 1999 authorizations (including Philipsburg WWTF), would not be implemented in the renewal for the reasons discussed above regarding the 1994 DHES memorandum. Philipsburg WWTF has an individual permit now, but the same DEQ determination is still applicable.

Appendix H: Rationale for WQBELs

Scope and Authority

Permits are required to include WQBELs when TBELs are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). Limits from the previous permit are maintained or tightened to comply with ARM 17.30.637(1)(d) ('free from' substances that will create concentrations of materials which are toxic or harmful to human, animal, plant, or aquatic life). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards (ARM 17.30.601-670) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses, including compliance with applicable standards in Circular DEQ-7 and DEQ-12A.

Calculations for Reasonable Potential (RP), Waste Load Allocations (WLA), Long Term Average (LTA), and Final Limits

For purposes of assessing the need for and calculating WQBELs, DEQ uses a mass-balance equation (*Equation 1*) to determine the concentration of a pollutant of concern after accounting for other sources of pollution in the receiving water and any dilution provided by a mixing zone. *Equation 1* is based on the EPA Technical Support Document for Water Quality-based Toxics Control (TSD)(EPA/505/2-90-001).

$$Q_rC_r = Q_sC_s + Q_dC_d \text{ (}\textit{Equation 1}\text{)}$$

Where:

Q_s	=	receiving water low flow rate above point of discharge (mgd)
C_s	=	upstream receiving water pollutant concentration (mg/L)
Q_d	=	effluent flow rate (mgd)
C_d	=	critical effluent pollutant concentration (mg/L)
Q_r	=	receiving water flow rate after discharge (Qr = Qs + Qd; mgd)
C_r	=	receiving water pollutant concentration (after dilution; mg/L)

RP analysis derives *Equation 2* from *Equation 1* to determine the receiving water pollutant concentration (C_r). See *Equation 2*. C_r is compared to the water quality standards to determine if numeric or narrative water quality standards are exceeded for acute and chronic aquatic life standards and/or human health standards, and then the development of WQBELs is continued according to ARM 17.30.1345.

$$C_r = [C_dQ_d + C_sQ_s] / [Q_s + Q_d] \text{ (}\textit{Equation 2}\text{)}$$

Equation 2 Rationale:

$Q_rC_r = Q_sC_s + Q_dC_d$ (*Equation 1*)
$C_r = [C_dQ_d + C_sQ_s] / Q_r$
Note: $Q_r = Q_s + Q_d$

The amount of pollutant in the discharge that the receiving water may assimilate and not exceed the applicable water quality standard is referred to as the waste load allocation (WLA). A WLA is not a WQBEL. The WLA is the basis for calculating effluent limitations that protect aquatic life from both acute and chronic effects.

Equation 3 can be used to calculate WLAs for the same point source discharge and pollutants of concern. *Equation 3* is derived directly from *Equation 1* to determine the effluent pollutant concentration (C_d=WLA). See *Equation 3*. C_r will be equal to the applicable water quality standard to determine the maximum allowable concentration of pollutants of concern in the effluent. The WLA calculation will take into account all applicable water quality standards, regulations, and implementation policies, such as dilution and mixing zone policies. A separate WLA will be calculated for each pollutant of concern with reasonable potential for each applicable numeric standard or numeric standard of a narrative standard.

$$WLA = C_d = [Q_rC_r - Q_sC_s] / Q_d \text{ (}\textit{Equation 3}\text{)}$$

Equation 3 Rationale:

$Q_rC_r = Q_sC_s + Q_dC_d$ (*Equation 1*)
$Q_dC_d = Q_rC_r - Q_sC_s$
$C_d = [Q_rC_r - Q_sC_s] / Q_d$
Note: $Q_r = Q_s + Q_d$

The WLAs are characterized as a level of effluent quality that can never be exceeded. For human health standards, the WLA becomes the average monthly limit and exceedances can occur. These exceedances can only be quantified if the permit includes both a maximum daily limit (equal to the WLA also) and daily monitoring; otherwise, the average monthly limit is reflective of the average effluent quality. Therefore, the long-term average (LTA) for the discharge concentrations of pollutants of concern is necessary to achieve the acute and chronic WLAs. The LTA is considered a back calculation of the WLA based on water quality standards and is calculated by multiplying the WLA by the WLA multiplier. The WLA multiplier is a statistically-based factor derived from the ratio of the WLA, set at a specific percentile value, to the LTA. The value of the multiplier varies depending on the coefficient of variation (CV) of the data set (calculated from the permittee's DMRs or assumed according to TSD standards as 0.6),

the percentile value for the WLA (e.g., 99th percentile), and whether the WLA is based on an acute (1-hour average) or chronic (typically, 4-day average) water quality standard.

DEQ sets the WLA at the 99th percentile on the lognormal distribution and uses *Equation 4* to determine the LTA for each pollutant of concern. The EPA's TSD procedures provide reference Table 5-1 for the WLA multipliers.

LTA=WLA x WLA multiplier (*Equation 4*)

The LTAs for a pollutant of concern may be directly compared to each other to select the most protective of aquatic life. Both WLAs are ensured to be met with the selection of the most protective LTA (attains both acute and chronic criteria) and sets one basis for facility performance.

The process of deriving permit limits needs to consider effluent variability with the assumptions that effluent discharge is continuous and the WLA value will never be exceeded. The lowest LTAs are used to calculate a Maximum Daily Limit (MDL) and Average Monthly Limit (AML). Both MDL and AML are calculated from *Equation 5a* and *Equation 5b*. The TSD provides reference Table 5-2 for the LTA multipliers that are based on a lognormal distribution and reflect a statistical relationship (MDL-99th percentile occurrence probability; AML-95th percentile occurrence probability). The EPA's TSD verifies this method of deriving permit limits as protective of aquatic life because the MDL and AML consider effluent variability. The MDL and AML are proposed as the final effluent limits.

MDL=LTA x MDL Multiplier (*Equation 5a*)

AML=LTA x AML Multiplier (*Equation 5b*)

Tables H.1 and **H.2** display calculations for RP, WLA, LTA, and Final Limits for pollutants of concern as needed.

H.1 Philipsburg WWTF Reasonable Potential Analysis[1]

Parameter	Units	Acute Standard	Chronic Standard	Human Health Standard	Critical Effluent Conc. (C_d)	Critical Background Receiving Water Conc.(C_s)	Acute Dilution Factor	Chronic Dilution Factor	Projected Receiving Water Conc. Acute (C_r)	Projected Receiving Water Conc. Chronic (C_r)	RP
Oil and Grease	mg/L	10	NA	NA	6.2	NA	0	0	6.2	6.2	N
Nitrite + Nitrate, total as N	mg/L	NA	NA	10	1.16	NA	0	0	1.16	1.16	N
Ammonia[2]	mg/L	3.83	1.63	NA	21	0.02	100%		0.23		N
Total Residual Chlorine (TRC)[3]	mg/L	0.019	0.011	NA	NA	0	1%	10%	NA	NA	N
Nitrogen, total as N	mg/L	NA	0.5	NA	NA	NA	0	100%	NA	NA	Y[4]
Phosphorus, total as P[5]	mg/L	NA	0.072	NA	NA	NA	0	100%	NA	NA	Y[4]

Footnotes:
(1) C_d determined using standard procedures as defined by the TSD.
(2) Previously granted mixing zone used for RP analysis. Philipsburg is required to complete a mixing zone study for ammonia with the permit renewal to determine applicability of granted mixing zone.
(3) Philipsburg did not employ chlorine disinfection during the previous permit cycle.
(4) TN and TP have reasonable potential to contribute to an excursion above state water quality standards per assigned WLAs as part of a TMDL.
(5) Reference **Table I.1** for TP Limit Calculations based on an approved General Nutrient Standard Variance.

H.2 Nitrogen: WLA, LTA, and Limits Calculations[1]

Parameter	Units	Acute	Chroni	CV	Acute WLA	Chronic WLA	Acute Long Term	Chronic Long Term	MDL	AML	Final	Final

		WLA										
Nitrogen, total as N	mg/L	NA	NA	0.07	NA	NA	NA	7.07[2]	NA	1.65	NA	11.7[3]

Footnotes:

(1) Calculations performed using standard procedures as defined by the TSD.

(2) The average concentration from DMR data was used as the LTA to cap at current performance per assigned WLA.

(3) Limit will be expressed as a load: 15.6 lbs/day and applies from July 1 through September 30. Also, reference **Table D.2.**

Appendix I: General Nutrient Standards Variance

Flint Creek is located within the Montana Ecoregion Level III: Middle Rockies (17) with base numeric nutrient standards for an individual wadeable stream, Flint Creek (from Georgetown Lake outlet to the ecoregion 17ak boundary: 46.4002, -113.3055) for the period of July 1 to September 30. Department Circular DEQ-12A Montana Base Numeric Nutrient Standards (DEQ-12A) establishes the following standards:

Total Phosphorus: 0.072 mg/L
Total Nitrogen: 0.500 mg/L

Montana state law (§ 75-5-103 (22), MCA and 75-5-313, MCA) allows for base numeric standards variances (DEQ-12B) from a determination that the standards cannot be achieved because of economic impacts, the limits of technology, or both. Because the treatment of wastewater to base numeric nutrient standards would result in substantial and widespread economic impacts on a statewide basis (§75-5-313(5)(a), MCA), a permittee who operates lagoons not designed to actively remove nutrients and meets the end-of-pipe treatment requirements may apply for a general nutrient standards variance and DEQ shall approve such a request. The general variance end-of-pipe treatment requirements for lagoons not designed to actively remove nutrients are:

Total Phosphorus: Maintain current performance
Total Nitrogen: Maintain current performance

For facilities covered under the general variance for nutrients (DEQ-12B), nutrient limits are expressed as a monthly average, mass-based limit derived from current performance.

The Flint Creek Planning Area Nutrients TMDLs and Water Quality Improvement Plan identifies Philipsburg WWTF as a contributing source for TP impairments and assigns a wasteload allocations for TP. Per the TP WLA, Philipsburg WWTF has requested the general nutrient standards variance as part of a staged implementation process to comply with the water quality target of 0.072 mg/L. DEQ has approved their request. Calculations are displayed below in **Table I.1**. Philipsburg WWTF did not request a general nutrient standards variance for TN because the TMDL assigns a TN WLA that will continue current operating conditions reflective of the average summer growing season as lbs/day. The TN WLA is calculated in **Appendix H**. General nutrient standards variances can be requested when a permittee cannot comply with a WLA. The WWTF should be able to meet the TN WLA without a variance. Philipsburg WWTF may apply for a TN general nutrient variance in the future, as needed, and DEQ shall determine approval of such request upon receipt.

Table I.1: Nutrient Variance Limits Calculations

Parameter	Units	CV	Chronic	AML	Final	Mass Based

			Long Term Average[1]	Multiplier[2]	AML	Limits
Phosphorus, total as P	mg/L	0.4	2.14	1.36	2.91	3.88 lbs/day

Footnotes:
(1) The average concentration from DMR data was used as the LTA to cap at current performance.
(2) The Average Monthly Load Multiplier were determined using standard procedures as defined in the TSD.